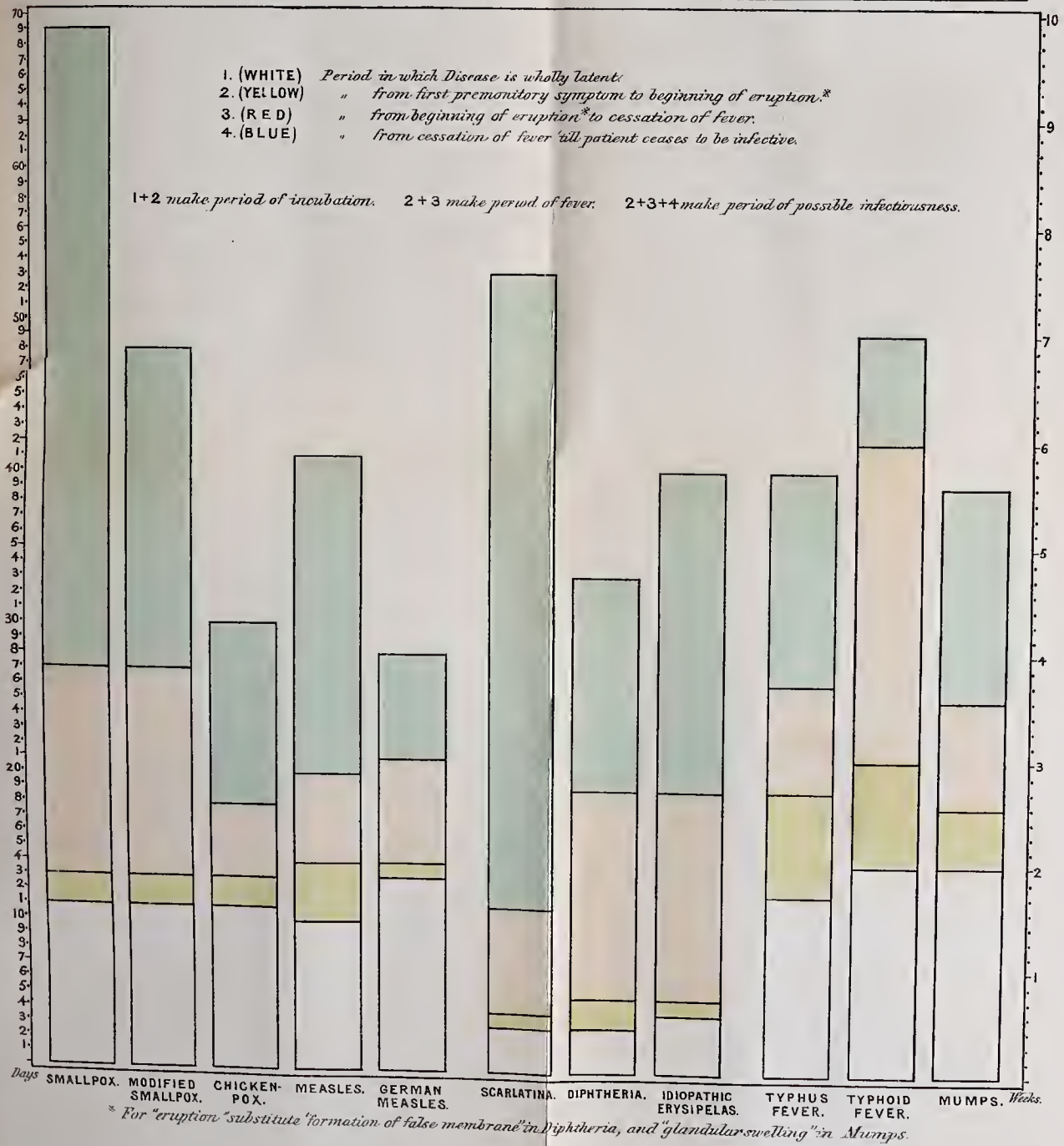


DISEASES.	TIME from inception to beginning of eruption.	TIME from first precursory symptom to beginning of eruption.	TIME from beginning of eruption to cessation of pyrexia.	TIME from beginning of eruption till patient ceases to be infective.
Smallpox	13 days (range, 7 to 21 days.)	2 days (range, a few hours to 7 days.)	14 days.....	56 days.
Modified Smallpox	13 days (range, 7 to 21 days.)	2 days (range, a few hours to 7 days.)	14 days.....	35 days.
Chicken-pox	13 days (range, 4 to 17 days.)	2 days (range, a few hours to 3 days.)	5 days..... (range, 3 to 7 days.)	17 days.
Measles.....	14 days (range, 7 to 21 days.)	4 days (range, 1 day to 9 days.)	6 days.....	27 days.
German Measles.....	14 days (range, 10 to 20 days.)	1 day (range, nil to 3 days.)	7 days.....	14 days.
Scarlatina	4 days (range, a few hours to 14 days.)	1 day	7 days.....	49 days.
Diphtheria	5 days (range, 1 day to 14 days.)	2 days (range, a few hours to 4 days.)	14 days.....	28 days.
Idiopathic Erysipelas	5 days (range, 2 to 14 days.)	1 day	14 days.....	35 days.
Typhus Fever	19 days (range, a few hours to 28 days.)	7 days..... (range, 3 to 7 days.)	7 days..... (range, 7 to 14 days.)	21 days.
Typhoid Fever.....	21 days (range, 1 day to 28 days.)	7 days..... (range, 7 to 12 days.)	21 days..... (range, 14 to 23 days.)	28 days.
Mumps.....	18 days (range, 8 to 25 days.)	4 days.....	7 days.....	21 days.



(8)

THE
DURATION OF THE LATENT PERIOD,
THE FEVER,
AND THE
INFECTIVENESS OF THE EXANTHEMATA,
AND SOME ALLIED DISEASES.


A Paper read before the North-Western Association of Medical Officers of Health, at the Town Hall, Warrington, on February 14, 1884.

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The Duration of the Latent Period, the Fever, and the Infectiveness of the Exanthemata and some Allied Diseases.

THERE are few questions so frequently put to members of the medical profession as questions relating to the limits of the infectiousness of infectious diseases ; and few so difficult to answer truly and with some approach to precision. A child has been temporarily exposed to infection, thus far without injury, and the parents want to know when it may be considered safe ? A specific eruption appears, and the friends of the patient want to know when the disease was probably caught ? A patient shows the earliest signs of fever, and one is asked when the distinctive rash may be expected ? Then when the disease is subsiding there are a series of embarrassing inquiries to be answered. When may the patient go out ? When may he travel ? When may he return from the seaside, and go back to school ? When may the infected bedroom be used again ? In most cases if such questions were submitted to several general practitioners, it is almost certain that the replies obtained would differ considerably. What more convincing evidence could there be of the uncertainty there is in connection with this topic ?

Differing judgments serve but to declare
That truth lies somewhere, if we knew but where.

Yet these questions are practical, they are of vital importance and of paramount interest for all ; moreover they relate not to matters of opinion but matters of fact. Impressed with these reflections, I propose, so far as the brief time at my disposal will permit, to go over some of the testimony of competent observers of infectious disease, and out of such testimony to construct a table which I shall then present for approval, criticism, or correction. I am sure that the work of drawing upon such a table will be instructive to

myself, and I trust also useful to others. The headings to my table will be as follows :—

1. Time from inception to beginning of eruption.
2. Time from first precursory symptoms to beginning of eruption.
3. Time from beginning of eruption to cessation of pyrexia.
4. Time from beginning of eruption till patient ceases to be infective.

Under these headings I propose to enter what appears to be the typical or normal duration of the inlying stage, the invasion stage, the stage of eruption, and the stages of eruption and convalescence of the diseases ordinarily classed as exanthemata and continued fevers. And, since the normal duration of the stages of these diseases cannot be stated with certainty—estimates being at best but proximately accurate—my table will afford space for entering up the possible range of duration of the first three stages. By *possible* range I mean the extreme limits of duration according to the best authorities.

Without further preface I shall proceed to the task of examining the course of the first group of diseases to be considered ; this group including smallpox, modified smallpox, chicken-pox, measles, and r6theln, or German measles.

SMALLPOX.—Marson, who has had very exceptional opportunities of studying this disease, fixes the incubation period definitely at 13 days. Makuna, whose experience as superintendent of Fulham Hospital makes him an authority, says the pre-eruption stage is “between 12 and 14 days, but it varies from 9 to 21 days.” Curschmann assigns to variola a period of incubation from 10 to 13 days, the limit being 5 to 14 days. (He seems to refer to the time during which the disease is altogether latent.) Bärensprung gives 12 to 13 days as the incubation period. Haddon's Reports contain but two cases : in one the incubation was found to be 11 days, in the other 13 days. Out of the large number of smallpox cases coming under my observation in 1877, in 5 only did I succeed in fixing the time between exposure to infection and the commencement of the eruption. Particulars were published some years since. The periods were as follows : S. B., 19 to 20 days ; M. B., 13 days ; E. O., 13½ days ; M. M., 13 to 15 days ; S. H., 17 to 18 days. I hold, therefore, that the normal time from inception to the beginning of the eruption is fully 13 days. The normal time in

inoculated smallpox is known to be fully 7 days—Dr. Bristowe says 7 to 8 days. The outside limits of this time in natural smallpox must be set down as from 7 to 21 days. Deviations from the normal incubation period, except of a day or two, are rare. In many cases where it appears to be protracted to 19 or 20 days, it is probable that the exposure infected the subject's clothes, which subsequently communicated the infection.

The time from the first precursory symptoms to the beginning of the eruption is difficult to determine, because a physician is rarely by the side of a healthy person to note the first indications of departure from the standard of health. Fortunately for our enlightenment on this point, the pre-eruptive symptoms in smallpox are rational as well as physical; and the main rational symptoms (headaches, pain in the limbs, and lumbar pains) are not likely to escape the observation of the patient. I was thus able in 1877 to obtain the date of sickening and the date of the commencement of the eruption of 526 cases. In 17 the first sense of illness was referred to the day on which the eruption began to appear, in 175 to the day before, in 166 to two days before, in 100 to three days before, in 40 to four days before, in 14 to five days before, in 12 to six or seven days before, in one to eight days before, and in one to fourteen days before. Thus 33 per cent of those patients were themselves sensible of prodromata a day before the eruption began, 31½ per cent two days before, and 19 per cent three days before. I submit, therefore, that the normal duration of the pre-eruptive symptoms is about two days. Its range is probably from a few hours to a week.

The time from the beginning of the eruption to the cessation of the pyrexia has no marked hygienic significance, nor is it a matter on which there is much diversity of opinion. For about ten days the fever and pulse go up, and in three or four they subside again. Whether the rash be confluent or discrete makes little difference as to the duration of the fever. From the beginning of the eruption to the resumption of the normal temperature we may reckon 14 days.

After the temperature and pulse are again normal, the patient may get up; and the crusts harden and shed. In confluent smallpox this, with the exercise of every care, may be expected to occupy six weeks. In mild cases not less than three weeks should be allowed for it. The normal time from the beginning of eruption till the patient ceases to be

infectious may thus be fixed at five weeks in discrete smallpox, and eight weeks in confluent smallpox. Of course the period of infectiousness may be prolonged almost indefinitely if special measures be not taken to effect the removal of the crusts, especially from the head and beard. Is there, then, no difference in the length of the stages of confluent smallpox and the mild variety of the disease usually found in post-vaccinal cases? I think the only difference is that in the former the crusts take longer forming and shedding, and that, as a rule, the eruption may be a few hours later. The so-called "malignant" smallpox is an exception to all rules. There is no defined pre-eruptive stage, because the eruption is abortive, and the patient usually dies before the time when one usually expects the maximum temperature.

CHICKEN-POX.—The evidence as to the length of the incubation stage is, of course, not so abundant in this disease as in smallpox. Still, there is sufficient to show that it is not much longer or shorter than in smallpox. Dr. Murchison fixes the period in chicken-pox at 11 days, Trousseau and Hutchinson at from 4 to 17 days, Dr. W. Squire at from 10 to 12 days, Dr. Thomas (of Leipzig) at from 13 to 17 days, and Dr. Gee at about a fortnight. Dr. Makuna was enabled to determine the period between exposure and the beginning of the eruption in four cases—it was 9, 12, 13, and 17 days. The normal length of the pre-eruptive stage appears to be 13 days; the extremes 4 to 17 days. In Dr. Steiner's eight successful cases of inoculation, the incubation period was found to be 8 days. The precursory signs are often not very pronounced in chicken-pox, but there is generally thirst, languor, nausea, and some increase of temperature for from a few hours to three days before the eruption begins. The normal prodromal stage is probably the same length as in smallpox. Some fever usually continues after the appearance of the eruption for from 3 days to a week; about five days may be taken as the typical time. The vesicles dry up in about 6 days, and should be ready to wash off 4 days later. I hold, therefore, that 17 days after the beginning of the eruption the patient is usually non-infective.

MEASLES.—The difficulty in fixing the normal incubation period of measles is greater than in most diseases, because it is probable the disease is infective before the eruption has begun to appear. Mr. Croskery, in a paper contributed to the *Lancet*, of November 25th, 1882, cites a case in proof of this, and many others have been recorded. He writes:—

"C. D. drove in the same cab with W. C. to school ; on the same day W. C. came home early, shivering and with a temperature of 101° . On the morning of the fifth day, or 96 hours after invasion, the rash of measles developed on W.C. In the course of ten days C. D. sickened. This will illustrate exposure on the very first day of invasion, followed by the communication of the disease." Mr. Croskery has had many cases where complete isolation was effected before the commencement of the rash, and yet the disease spread. As regards the normal time from inception to the beginning of the eruption, I will quote from a letter of my own, which appeared in the *British Medical Journal* of March 17th, 1883:

"A local girls' school opened on January 15th, and on the 25th one of the teachers showed a rash, which was recognised as measles. On inquiry it transpired that she had a brother suffering from measles at her home in Liverpool. Immediately the disease was diagnosed, the teacher was removed ; but on February 8th, five children, all belonging to this teacher's class, began to develop the eruption, and were sent away. On the 22nd another child showed the eruption, and on the 25th another. These facts seem to me strongly to corroborate what has been laid down by the best authorities on this subject. Nearly all mention 14 days as a usual period of incubation in measles, reckoning from the inception to the appearance of the rash. Tanner fixes the period at 10 to 14 days ; Aitken, at 13 to 14 days ; Squire, at 7 to 17 days ; and Bristowe, at 7 to 21 days. In the Farøe Islands' outbreak, when the best opportunities for making exact observations offered, it was noticed that 'in all cases 13 or 14 days elapsed from the day of infection to the commencement of the eruption, whether the infection had taken place during the prodromal or the eruptive stage.' (Ziemssen.) Again, in the nine cases returned to Dr. Haddon, when he was investigating this subject, the incubation period ranged from 10 to 14 days."

The typical pre-eruptive period may be set down at 14 days ; the extreme range being 7 to 21 days.

How long are the symptoms which usher in an attack of measles (for the most part increased temperature, coryza and catarrh) continued before the rash begins? Mr. Croskery says, usually from 72 to 84 hours. My own opinion is the precursory symptoms generally last four days. Sir Thomas Watson says, "the regular period for the appearance of the eruption is the fourth day of the disease ; seldom earlier,

frequently later : sometimes as late as the eighth or tenth day from the commencement of the catarrh." Thus I should incline to put the precursory symptoms as occupying from three to nine days, but I find Sir William Watson speaking of two epidemics of "putrid" measles he witnessed, when the eruption appeared as early as the second day of the disease. I propose therefore to mark the precursory symptoms as lasting from one to nine days, normally four.

As regards the cessation of pyrexia, Mr. Croskery says : "Normal temperature in an uncomplicated case is reached on the eighth or tenth day after invasion." This agrees with my own views. The temperature tends to rise with the first appearance of the rash, but after about six days it should be again normal. After the eruption and fever have disappeared, and the patient is so far convalescent, he must still be regarded as infectious. Ordinarily the whole surface of the cuticle has to be shed, though as it comes off in fine branny flakes the desquamation is little noticed, and the inflamed mucous membranes must have time to recover. This may be put down as occupying three weeks, so that with the help of bathing and proper treatment a patient may usually reckon on being able to join the rest of the family or return to school after the lapse of 31 days from the time of invasion, or 27 days from the commencement of the eruption.

GERMAN MEASLES is so exceedingly infectious at an early period, and often at the same time so mild, that it may be caught from unrecognised cases. The evidence as to the time of incubation does not vary more than in allied diseases. Dr. Briggs says : "Ten to 14 days seems to be the usual period, but in some cases a much shorter time is found to be sufficient." Dr. G. F. Hodgson (Brighton) says : "A careful inquiry about the incubation has led to 16 days being considered the usual period, but in some instances it has seemed to extend to 18, and in others even to 20 days." Dr. Donovan (Cork), who had to deal with an outbreak of the disease from October, 1879, to March, 1880, says it has an incubation stage of a fortnight. Dr. Dukes (Rugby) gives 22 cases in which he was able to fix the time of incubation—the range is from 12 to 20 days, about four-fifths being between 12 and 16 days. Dr. Tonge-Smith's cases, notes of which appeared in the *Lancet* last June, appear to me to assist greatly in enabling one to determine the normal incubation period. He gives a sequence of 10 cases in which the time between exposure and the development of the disease

was ascertained—in six it was full 14 days, in one between 8 and 18 days, and in three any time not exceeding 18 days. He also refers to two servants who attended two cases in the early stages and developed the disease 14 days after exposure. In his second paper he gives a sequence of four cases, three having a 14 days and one a 15 days' incubation; also two cases in which the incubation did not exceed 15 and 16 days respectively. The normal period from inception to eruption appears to me to be the same as in measles—14 days. The range may be put at from 10 to 20 days,

Dr. Donovan says the disease has a "short pyrexial period, the rash appearing in most instances in 24 hours." Most authorities agree that the onset of the disease is sudden, and that the precursory symptoms (a little headache and malaria, slight cough, red eyes and chilliness) do not precede the rash by more than a day. Precursory symptoms may be absent, or, very exceptionally, may last two or three days.

In bad cases the rash may take nearly a week to fade, and leave the skin roughened, but by the end of a week all the symptoms, including the pyrexia, will have disappeared. With careful attention to bathing, the patient should be able to resume his ordinary occupation fourteen days from the beginning of the eruption.

The second group of diseases I propose to consider consists of three—scarlatina, diphtheria, and idiopathic erysipelas.

SCARLATINA.—The incubation period of this disease seems to be liable to greater variations than any of those yet referred to; indeed in some cases there appears to be scarcely any such period. Dr. Gee says it is probably less than a week, and may be no more than 24 hours. Dr. Bristowe's opinion is similar; he puts it at 6 or 8 days, remarking that it is rarely longer and often shorter, and may be only 1 day. Dr. Squire is also in agreement with this view; he says the period is generally within 7 days, and may be only a few hours. Dr. Aitken gives the time at from a few hours to 10 days. In the eight cases returned to Dr. Haddon the period ranged from a few hours to 11 days. Dr. Murchison, in a paper read at the Clinical Society in May, 1878, upon the incubation period of scarlet fever and some allied diseases, gives the results of observation in 75 cases of scarlet fever, extending over a period of twenty years. In one the time from exposure to the appearance of the first symptoms indicating departure from health did not exceed 18 hours.

In not one did the incubation period exceed 6 days, in forty-four it did not exceed 4 days, in sixteen it did not exceed 2 days, and in fifteen it did not exceed 24 hours. Trousseau records a case where the incubation period was from 6 to 8 hours. Dr. Dukes cites fifteen cases in which he ascertained the time between the exposure to infection and development. In four cases it was 1 day, 6, 7, and 9 days respectively; in three it was 2 days, in two 3 days, in four 4 days, and in two 5 days. Dr. Tonge Smith, writing on the incubation of scarlet fever in the *British Medical Journal*, January 27th, 1883, cites twelve cases. In four there was a definite short exposure to infection, followed by isolation, and toward the end of the third day (third period of 24 hours) after exposure the onset of the disease took place. In another one there was a short exposure in an omnibus with an infectious subject, and the onset of the disease was at the end of the third day. In three 3 days were not exceeded, in one 4 days was the maximum, and in two 5 days was the maximum. In one a healthy subject was sent into the scarlatina ward by error and remained in it a fortnight before showing signs of having taken the disease. Several cases of this kind have been recorded but they prove nothing except that a person may remain for many days surrounded by infection without being infected. However, in Ziemssen, authorities are quoted in proof that scarlatina may be long incubating, even as long as 14 days. Turning to "scarlatina incubation" in *Dr. Neale's Digest* I was surprised to find "4 weeks." The reference is to a letter from Mr. J. A. Raye to the *Lancet* (April 24th, 1875.) The narration is that a young gentleman went home from school, where there had been an outbreak of scarlatina, was isolated, given baths, and treated with a view to prophylaxis. He remained apparently well for three weeks and five days, and then started for London, and two days after his arrival the scarlatina rash appeared. Mr. Raye remarks that "it may be possible the young gentleman wore the same top-coat that he travelled in home from school, and he may thus have received a fresh dose of the fever poison." I need hardly say that stronger evidence than this will be required to prove that the incubation period of scarlatina is ever 4 weeks. I think the normal period (if there be a normal period) may be placed at 4 days—the extremes being a few hours to 14 days. Surgical and *post partum* scarlatina are said to have an especially brief incubation period. In a successful inoculation mentioned by Thomas the period was 7 days.

The few symptoms preceding the appearance of the rash will rarely be found to occupy more than 24 hours. Though doubtless they often fail to be noticed, there is probably always some disturbance of the temperature and some malaise, &c., to give warning of the disease before the eruption.

Though so much has been written upon scarlatina it is not easy to get direct evidence on the length of the fever stage in a normal case. For information I have referred to my own notes on hospital cases, and I find that in about a week after the appearance of the rash the temperature comes down to normal, the ordinary range being five to eight days. Of course there are exceptions, *e.g.*, in one case the temperature remained up for 23 days, and in another longer; but in both cases there was something other than scarlatina to account for this condition. The normal time from the beginning of the eruption to the cessation of the pyrexia is, I think, one week.

There is a very general belief in the infectiousness of scarlatina being exceptionally long continued. I apprehend the facts are that the contagion is carried by the breath as long as there is any sore-throat, by the perspiration till desquamation is completed, and by the dejections as long as the mucous lining of the alimentary canal is congested. If the patient be properly isolated and great care taken that nothing contaminated by the breath, perspiration, or alvine discharges, leaves the room without efficient disinfection; if the patient be not discharged till he is thoroughly peeled (head and feet), till his throat is without the faintest blush, and his discharges are regular, and he has been properly cleansed, there need be no fear of his communicating the disease. The time of the patient's detention will necessarily vary considerably, according to the severity of the attack. I find by reference to my books, that I generally get my patients out of hospital in about a month or five weeks after the date of the commencement of the rash. Occasionally it is between three and four weeks, sometimes between five and seven. I find I have never kept a patient longer than 49 days after the first appearance of the rash. At a meeting of the Clinical Society on January 26th, 1883, Dr. Longhurst read a paper, in which he attempted to prove scarlet fever was infectious in the pre-eruptive stage, but not in the stage of desquamation, but the cases he instanced were insufficient to support his conclusion. In July, 1877, he wrote a letter to the *Lancet*, saying "that the early period of the disease is

that in which infection is most active," and giving his reasons for this belief. He is apparently in favour of discharging the patient without reference to "peeling." He would let the patient out "when the pulse and temperature is normal and convalescence is established." He adds that the time will vary with the epidemic, case and constitution, and habits of patient, and proposes to fix the end of the third week from the appearance of the rash in each ordinary case. Very few will agree with Dr. Loughurst, and there is abundant evidence that a scarlatina patient is unsafe at the end of the third week. Dr. Houghton, of Dudley, cites a case showing that 38 days after the commencement of the rash a patient was capable of conveying the disease (*Lancet*, Sept. 22, 1877). Dr. Daly, of Dalston, says he was called to a case on June 19. It was the second day of the disease. "Complete isolation was observed, the child had a special nurse, and disinfection was well carried out," &c. On Aug. 11th the child again mixed with her brothers and sisters, and on the 16th a brother sickened, and the next day the rash was out, 54 days since the sister showed the rash (*Lancet*, Aug. 25, 1877). Mr. Tinley (Whitby) tells how a lad was attacked with scarlatina in school, was taken to the fever hospital and kept for eight weeks, and yet about 12 days after he returned home a brother caught the disease, and two days later a sister. As the first patient came home from hospital with an ulcerated nose, Mr. Tinley believes this must have been the source of infection (*British Medical Journal*, Feb. 3, 1883). Dr. Spottiswoode Cameron contributed a paper to the *Lancet* of Dec. 23, 1882, in which he quotes cases showing the disease may be communicated after long periods of time, and after the primary patient was to all appearance well. He concludes with the following sentence: "My own feeling about the infectiousness of scarlet fever at present is, that it is unwise to allow children to mix with others till desquamation has quite ceased, and my experience, during the last few years, of close upon a thousand cases of this disease at the Borough Hospital, is that the process is seldom completed before the eighth week, is often incomplete at the tenth, eleventh, and even the twelfth week, and is by no means always ended at the thirteenth week." One has thus to decide between the extreme caution of Dr. Cameron, and what one may almost call the rashness of Dr. Loughurst. I see that Dr. Miller, of Dundee, a very competent and close observer, considers a patient ceases to be infectious seven weeks after inception. I have

already stated that this is my own experience. However, there is far higher authority for fixing the period at seven weeks. Dr. (now Sir) Andrew Clark, speaking at the Clinical Society last year, said of scarlatina that there is no reasonable safety within six weeks, no perfect safety within seven.

I need not remind you that just as in smallpox there is a malignant form of the disease which is an exception to all rules, so also in scarlatina there is a form of the disease where there is no recognised stage of invasion and no eruption. The malady develops with extraordinary rapidity in the throat, and may prove fatal before it is diagnosed.

DIPHTHERIA, which in so many respects bears a likeness to scarlatina, resembles it also in this, that the incubation period is usually short, and yet liable to considerable variation. Bristowe puts the range at from a few hours to eight days, and Squire agrees in this, using almost the same words. The article in Ziemssen fixes the time at from two to three days, but quotes authorities showing a possible extension to 14 days. Sir John Cormack says, there is a great diversity of opinion as to the maximum period of incubation in this disease, the general opinion being that it does not exceed a few days. "There are facts and reasonings, however," he adds, "which suggests the possibility of the diphtheritic poison remaining dormant in the system for weeks or months, till called into action by favouring circumstances." Still this possibility is exceedingly remote. There is an interesting account of an outbreak of diphtheria in an isolated farmhouse, in the *British Medical Journal* of Dec. 1st, 1883. There was a well-marked case of the disease in a cottage in a neighbouring village, the contagion was carried to the farmhouse by a woman who had been in close attendance on the patient, and three days afterwards the eldest boy in the house sickened, the nature of the disease being distinct two days later. Six days after the arrival of the infection a domestic servant was attacked, seven days after another servant, eight and 11 days after two other servants. Thus in this series of cases the time from inception till the disease declared itself was from 5 to 11 days, or (supposing the last case was infected from the first) from five to eight days. I think that in about five days after exposure to infection the membrane may be looked for, and if the subject remains well over five days there will be little risk of his taking the disease. The eruption, when present, bright red and patchy, or like urticaria, may be looked for

about the same time, and may last from three or four hours to three or four days. The membrane may be distinct in 24 hours, and may not appear for 14 days.

The stage of invasion, which may be indicated by a little languor only, but is often marked by some huskiness of voice or a short cough, ranges from a few hours to four days. The normal time appears to be about two days.

From the time the membrane is formed till it is loosened and shed is about seven days, and a week after, in a normal case, the pyrexia is abated—often much earlier.

There is little evidence as to the time a patient should be held to be infectious after this—I think that 14 days is a safe maximum. In my hospital, where there are ample facilities for bathing and disinfection, I do not as a rule insist on even so long a quarantine. The whole time from inception to freedom from infectiousness I thus far estimate at 33 days. Of course there are cases where the disease runs its entire course from health to health in less than a fortnight; and cases so malignant that the patient is carried off before any exudation has taken place.

IDIOPATHIC ERYSIPELAS, an acute specific fever, infectious and occurring in epidemics, resembles the two diseases last discussed in having an incubation period of uncertain length and rarely exceeding a week. Marcus Beck, in his contribution to Quain's Dictionary, says the period is variously stated at from a few days to two weeks. He adds that the constitutional symptoms precede the local inflammation often by a day or more. "Usually within 24 hours of the invasion the characteristic cutaneous inflammation appears." The invasion is usually marked by chilliness, but probably the temperature is always increased. The temperature rapidly abates directly the disease ceases to spread. From the beginning of the inflammation to the fall of the temperature to normal I reckon a period of 14 days. I do not remember to have seen a case where it was more, and I have often seen it less. I do not mean to say that desquamation does not usually begin till the lapse of 14 days. It begins often in about 5 days, but while the inflammation is dying in one part it is spreading in another. As bearing upon the question of the length of the incubation stage, Sir Thos. Watson cites the following case: A gentleman's servant finding his brother ill received him into his bedroom and lodged him unknown to his master. The sick man had erysipelas and communicated the disease to his brother, and

the gentleman coming to see his servant caught the disease from him. In both master and servant the disease showed itself just seven days after they had come near the infecting patient. In another case the evidence is even more explicit—that of Dr. Elliotson, who caught the disease five days after the breath from one of his patients had come in his face. I think the normal time from inception to the beginning of the cutaneous eruption may be put at five days, the range being from 2 to 14 days. The length of the invasion stage I put at one day. From the beginning of the inflammation to the abatement of the fever I reckon two weeks, and from that till infectiousness ceases three weeks longer. This may appear a long time, but when the whole face and much of the scalp is affected, the desquamation is tedious. Moreover there is commonly an inflamed sore throat, which until cured must be held to indicate continuing infectiousness.

The third and last group of diseases to be discussed includes typhus fever, typhoid fever, and mumps.

TYPHUS FEVER.—There is probably no febrile disease on which there is a greater abundance of testimony as to the duration of the period of incubation; there is assuredly none in which a wider range is allowed. Haygarth makes the latent period from five days to two months, Bancroft from one day to five or six months, Barker and Cheyne from a few minutes to six weeks, Dr. Copland from three to 14 days, Dr. Peacock from 10 to 21 days, Barrallier 12 to 15 days, Dr. Tanner one to 12 days, Dr. Bristowe five to twenty-one days, or even more. There is good evidence on this matter published in a memoir in 1871, by Dr. Murchison. Some particulars are given of 31 cases. In 17 out of these, 12 days was within the known limit, in one it was not less than 21 days, and in two there was no latent period, or one only of a few hours. From the commencement of the indisposition to the appearance of the eruption is usually about a week; thus from inception to the beginning of the eruption may be counted 19 days, the range being from a few hours to 28 days. In 14 days from the beginning of the fever, or seven days from the first appearance of the eruption, the formidable symptoms subside, and the temperature is normal; and ten days or a fortnight afterwards the patient is fit to be discharged, convalescent and free from infection. I may here remark, that as the clothes of typhus patients are exceedingly difficult to disinfect, so as to make them absolutely safe, it is well if practicable to destroy them.

TYPHOID FEVER.—There is little direct evidence as to the incubation period of this disease. This may be accounted for by its not being infective in the ordinary sense, and the attack commonly comes on so insidiously its nature is not at once recognised. According to the article in Quain's Dictionary the incubation is probably in most cases about 21 days. There is loss of appetite, furred tongue, headache, chilliness, &c., and a regular rise of temperature from day to day. The spots may begin to appear on the fourth or fifth day, but not usually till after a week or more of fever. Fever lasts from 21 to 30 days. Dr. Murchison only met with two cases throwing light on the incubation time of typhoid in his own practice (in one the period was not longer than 21 days, in the other not longer than 14 days); but he quotes Lothholz, who in 19 cases at Jena found the period between 18 and 28 days; De la Harpe, who infers from 21 cases, that the period varies from six days to 11 weeks; and Dr. W. Budd, who states that a large number of cases led him to the conclusion the period was from 10 to 14 days. Dr. Murchison also refers to Griesinger's three instances, in which the attack commenced on the day following exposure to infection; and an outbreak in a school at Clapham, when 20 out of 22 boys were seized within four days of exposure. Liebermeister, in his article in "Ziemssen" makes the average period 21 days, and the extremes two to four weeks.

The irregular chills, headache, and pain in the limbs which are often the earliest indications of this disease may be absent, in which case diarrhœa will probably be the first symptom to attract attention. The temperature rises somewhat, and the tongue begins to fur at a very early period. However, the symptoms of invasion are generally so indefinite that the patient does not as a rule come into hospital, possibly does not consult a doctor till at least a week has elapsed. About this time, or a few days later, the eruption commences to appear, and continues coming out for at least a week. During the third week the morning remissions of temperature are more marked, and the patient begins to improve; or less marked, and the patient sinks into a "typhoid state" (nearly as low as in typhus). In the course of the fourth week, if the patient is to recover, and to escape sequelæ the temperature gradually falls to normal. If the patient continues well for a week after deservescence he may be discharged, as there is no risk of his infecting others, and the patient's health will be the sooner re-established when removed from hospital.

I enter up typhoid fever in my table as usually having 21 days from inception to the beginning of the eruption (range 1 to 28 days), out of which seven days are occupied with the stage of invasion (range 7 to 12 days). From the first appearance of the eruption to the cessation of the pyrexia I enter 21 days (range 14 to 23 days).

MUMPS.—The best evidence I can find of the incubation period of this disease is a note by Dr. Dukes, of Rugby, on the time from exposure to infection to the appearance of the characteristic symptoms of the disease in 37 cases. The range was from 14 to 25 days, and of the whole number 32 (86 per cent) showed a period of from 16 to 20 days, while in 18 (48 per cent) the period was 18 or 19 days. In Quain's Dictionary the period is stated to be from eight days to three weeks. I do not remember any case where a period of less than a week is recorded. There seems to be ordinarily about three or four days of premonitory symptoms, though these amount to little more than general malaise, and some slight fever, and are often overlooked. The swelling in a typical case probably reaches its height in about four days, and in three days later the temperature is again normal. In the table I enter 18 days as the time from inception to the commencement of the swelling (range from 8 to 25 days), four days of which are taken up with premonitory symptoms; and seven days as the time from the commencement of the swelling to the cessation of the fever. The patient may be considered as still infectious for two weeks after this.

Having thus completed my tabular statement, I am in a position to submit that the diseases considered, as regards the period of incubation, naturally divide into three groups, as I have classed them. In the first group the normal time from inception to the beginning of the eruption is about a fortnight (in a large proportion of cases this time is observed with remarkable exactness), the range is less than in the other groups, and the premonitory symptoms occupy from one day to four days, seldom more. In the second group the normal time from inception to the beginning of the eruption is about five days, the range is from a few hours to a fortnight, and the premonitory symptoms occupy from one to two days, seldom more. In the third group the normal time from inception to the beginning of the eruption is about three weeks, the range is wider than in the other groups, and the premonitory symptoms occupy from four days to a week.

I regard this natural grouping of these diseases as most

interesting and helpful to us in our study of them. For instance, there must be many other points of resemblance between the diseases in the first group than those I have mentioned—they are especially specific, none arise *de novo*, and the attack is not noticeably influenced by the surroundings of the patient at the time of the seizure, &c. The diseases in the second group on the other hand are much influenced by insanitary surroundings, some of them do occasionally arise *de novo*, and they all commonly affect the throat. It might be added that the *post partum* state appears especially to attract them. Bretonneau has remarked on this as regards diphtheria, and there are few practitioners but have had unhappy experience of the liability of patients just confined to be infected with the poison of scarlatina and erysipelas. The diseases in the third group, though generally spreading from subject to subject through known media, are eminently diseases of overcrowding and filth and depressing surroundings. It is probable that they may all originate *de novo*. Note also the tendency of certain glands to become affected in all these diseases.

In order that the points I desire to draw attention to may be presented to you in as graphic a way as possible, I have supplemented the table with a diagram showing the relative length of the diseases in the table, and of the stages of these diseases. On the left of the diagram is a scale marked off in days, on the right hand a scale marked off in weeks. At the foot are the names of the diseases whose course is projected. The period during which the disease is wholly latent is left white, the period from the first premonitory symptom to the beginning of the eruption is coloured yellow, the period from the beginning of the eruption to the cessation of the fever is coloured red, the period from the cessation of the fever till the patient ceases to be infective is coloured blue.

As my observations to-day have not been arranged as a formal paper but rather as an introduction to a discussion, I propose to conclude by anticipating two questions likely to arise, and answering them as far as I am able :—

Why does the list include erysipelas, &c., and yet leave out such diseases as relapsing fever and cholera? My answer is that I have included such diseases as I have personal knowledge of, and only these. Cases of erysipelas have been received into the Birkenhead Fever Hospital from the first, and appear to me to be cases well suited for treatment in an infectious diseases' hospital. On the other hand, relapsing

fever and cholera I know nothing of except from my reading—from this I gather that they would probably fall into my second group.

In pursuing this inquiry would not the best course have been to have made a separate table for each disease, setting down the period allowed to each stage by each author of repute, and taking out the mean? I answer no, first because the process would have been wearisomely long, and secondly because it would have been barren of results. The authorities I have given are only a few selected from a much larger number obtained from books in my own library. Multiplying authorities does not certainly help one to the truth in such a matter. Had I sought for light after this manner I should have found that the incubation period of all diseases ranged from a few hours to a few months, and the mean would not have represented the normal period with proximate accuracy.

Finally, it may be objected that there is no typical or normal duration to the stages of the febrile diseases under discussion, that they are so irregular in their behaviour they obey no law. Of course this is possible; but the contention that anything is exempt from law in a world of law and order is not one that will commend itself to ordinary intelligences. Rather let us blame our limited observations that the influences controlling the manifestations of disease are so imperfectly understood. And let each of us, in the future, observe more closely, note down more assiduously, and, above all, take heed that we have "truth in the measurements."

